

## EOS Mission Support Network Performance Report

This is a monthly summary of EMSnet performance testing -- comparing the performance against the requirements. Currently using updated BAH requirements (Oct '02), including missions through 2006

All results are reported on the web site:

[http://corn.eos.nasa.gov/performance/Net\\_Health/EMSnet\\_list.html](http://corn.eos.nasa.gov/performance/Net_Health/EMSnet_list.html).

It shows MRTG-like graphs of the performance to various test sites, including thruput, RTT, packet loss, and hops, with 1 week, 2 month and 6 month graphs.

### Highlights:

- ERSDAC remained bad through December: flow became noisy and erratic on 12 November. Problem fixed 3 Jan '03.
- ASF: problems continued through December (had begun 23 October), often supported by just a single T1, other times getting high packet loss. Problem appears to be fixed as of 3 Jan. '03.
- Thruput test results from NASDA to GSFC are limited not by the network, but by TCP window size limitations at NASDA. Accordingly, the rating has been modified to be based on NASDA → JPL performance, which has a higher limit, due to shorter RTT.
- Other test results were stable

### Ratings Changes:

Upgrades: ↑:

NASDA → US: Adequate → **Good**

Downgrades: ↓:

ASF: Good → **Low**

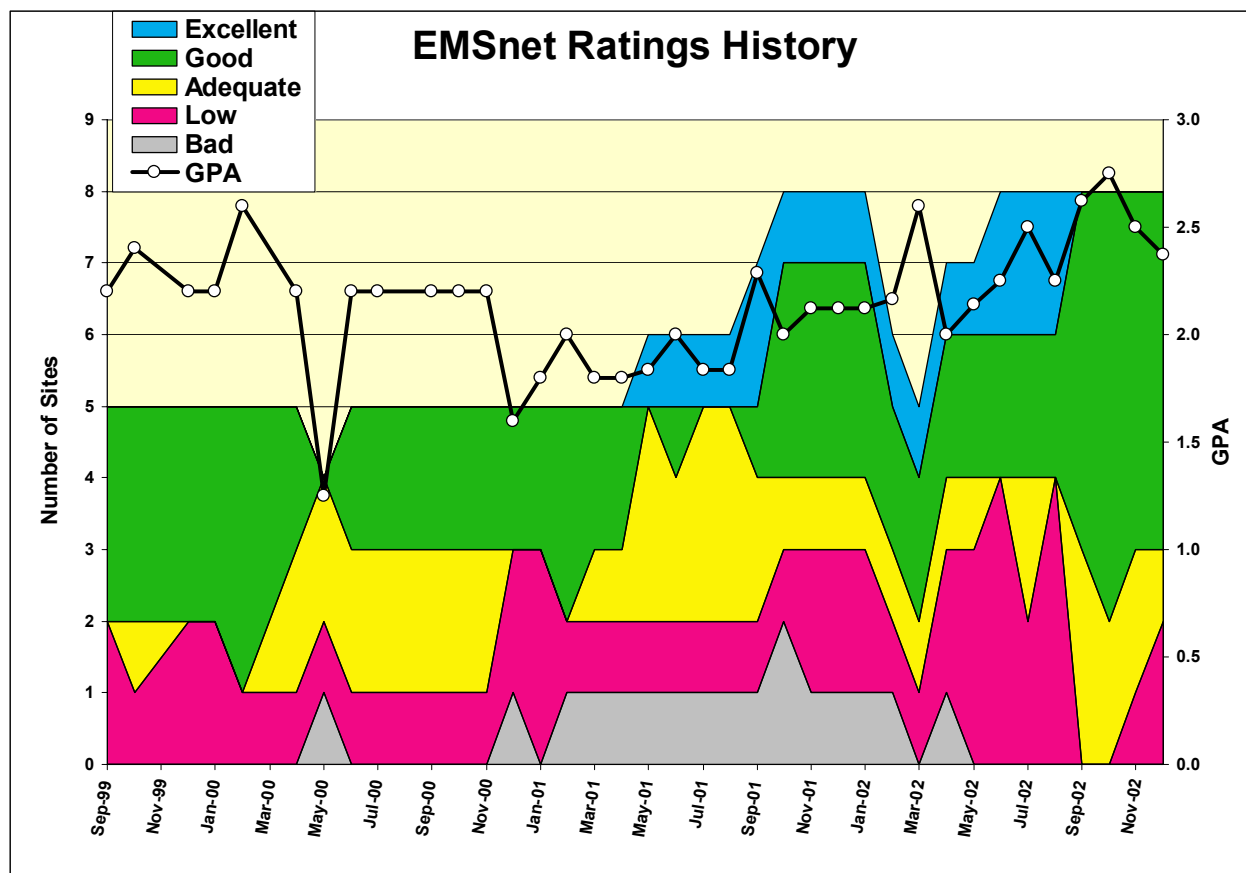
## Ratings Summary:

### Rating Categories:

**Excellent** :  $\text{Total Kbps} > \text{Requirement} * 3$   
**Good** :  $1.3 * \text{Requirement} \leq \text{Total Kbps} < \text{Requirement} * 3$   
**Adequate** :  $\text{Requirement} < \text{Total Kbps} < \text{Requirement} * 1.3$   
**Low** :  $\text{Total Kbps} < \text{Requirement}$ .  
**Bad** :  $\text{Total Kbps} < \text{Requirement} / 3$

Where Total Kbps = MRTG + iperf monthly average

The chart below shows the number of sites in each classification since EMSnet testing started in September 1999. Note that these ratings do NOT relate to absolute performance -- they are relative to the EOS requirements. The GPA is calculated based on Excellent: 4, Good: 3, Adequate: 2, Low: 1, Bad: 0

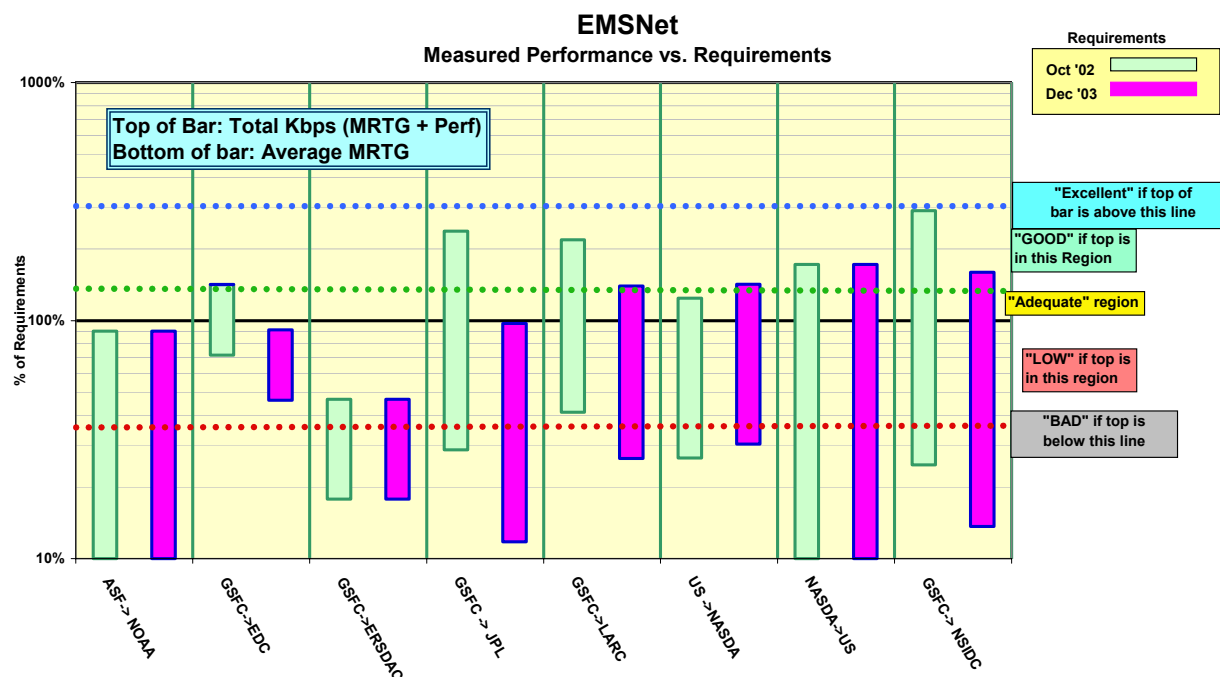


# EMSnet Sites: Network Requirements vs. Measured Performance

| December 2002   |                          | Requirements (kbps)                               |   | Testing                                  |               |               |                |                            |            |                            |       |
|---|--------------------------|---|---|--|---------------|---------------|----------------|----------------------------|------------|----------------------------|-------|
| Source -> Destination   | Team (s)                 | Current (Oct '02)                                 | Future (Dec '03)  | Source Node : Test Period                | MRTG Avg kbps | Perf Avg kbps | Total Avg kbps | Current Status re Oct '02* | Prev Stat  | Current Status re Dec '03* |       |
| ASF-> NOAA  | ADEOS II                 | 1613  | 1613  | ASF->NESDIS: 29-Nov-02 - 31-Dec-02       | 72            | 1385          | 1457           | LOW                        | G          | LOW                        |       |
| GSFC->EDC   | MODIS, LandSat           | 147233  | 227988  | DOORS-EDCTest: 01-Dec-02 - 31-Dec-02     | 105600        | 103118        | 208718         | GOOD                       | G          | LOW                        |       |
| GSFC->ERSDAC  | ASTER                    | 467   | 467   | GDAAC: 12-Nov-02 - 31-Dec-02             | 83            | 135           | 218            | LOW                        | L          | LOW                        |       |
| GSFC -> JPL   | QuikScat, TES, MLS, etc. | 2825  | 6894  | CSAFS: 15-Aug-02 - 31-Dec-02             | 810           | 5898          | 6708           | GOOD                       | G          | LOW                        |       |
| GSFC->LARC  | CERES, MISR, MOPITT      | 38346   | 59979   | GDAAC: 18-Aug-02 - 31-Dec-02             | 15800         | 68011         | 83811          | GOOD                       | G          | GOOD                       |       |
| US ->NASDA  | QuikScat, TRMM, AMSR     | 1854  | 1620  | CSAFS: 23-Aug-02 - 31-Dec-02             | 491           | 1813          | 2304           | Adequate                   | A          | GOOD                       |       |
| NASDA->US   | AMSR                     | 1374  | 1374  | NASDA->JPL-SEAPAC: 02-Oct-02 - 31-Dec-02 | 78            | 2291          | 2369           | GOOD                       | A          | GOOD                       |       |
| GSFC-> NSIDC  | MODIS                    | 29249   | 53111   | GDAAC: 05-Nov-02 - 31-Dec-02             | 7240          | 77522         | 84762          | GOOD                       | G          | GOOD                       |       |
| Notes: All flow requirements listed are the greater of inflow or outflow    |                          |   |   |  |               |               | Ratings        |                            |            |                            |       |
| Flow Requirements (from BAH) include TRMM, Terra , Aqua, QuikScat, ADEOS II |                          |   |   |  |               |               | Summary        |                            | vs Oct '02 | vs Dec '03                 |       |
|   |                          |   |   |  |               |               |                |                            | Score      | Prev                       | Score |
| *Criteria:  | Excellent                | Total Kbps > Requirement * 3                      |   |  |               |               | Excellent      | 0                          | 0          | 0                          |       |
|   | GOOD                     | 1.3 * Requirement <= Total Kbps < Requirement * 3 |   |  |               |               | GOOD           | 5                          | 5          | 4                          |       |
|   | Adequate                 | Requirement < Total Kbps < Requirement * 1.3      |   |  |               |               | Adequate       | 1                          | 2          | 0                          |       |
|   | LOW                      | Total Kbps < Requirement                          |   |  |               |               | LOW            | 2                          | 1          | 4                          |       |
|   | BAD                      | Total Kbps < Requirement / 3                      |   |  |               |               | BAD            | 0                          | 0          | 0                          |       |
| Change History:   |                          |   |   |  |               |               |                |                            |            |                            |       |
|   |                          | 27-Sep-99   | Original - TRMM, Terra, and QuikScat                        |  |               |               | Total          | 8                          | 8          | 8                          |       |
|   |                          | 19-Jan-01   | Incorporated BAH requirements including additional missions |  |               |               |                |                            |            |                            |       |
|   |                          | 9-Apr-01  | Updated BAH requirements                                    |  |               |               | GPA            | 2.38                       | 2.50       | 2.00                       |       |
|   |                          | 4-Jun-01  | Added 50% contingency to BAH requirements                   |  |               |               |                |                            |            |                            |       |
|   |                          | 16-Nov-01   | Added MRTG to lperf, updated requirements, Revised criteria |  |               |               |                |                            |            |                            |       |
|   |                          | 2-Oct-02  | Updated to revised BAH requirements                         |  |               |               |                |                            |            |                            |       |

## Comparison of measured performance with Requirements:

This graph shows three bars for each destination. Each bar uses the same actual measured performance, but compares it to the requirements for two different times (Oct '02, and Dec. '03). Thus as the requirements increase, the same measured performance will be a bit lower in comparison.



Note: this chart shows that the performance to most sites is remarkably close to requirements. In the past, some sites have had performance way above the requirements, others way below. But now there are NO sites rated "Excellent" or "Bad" – ASF and ERSDAC are having problems, and are now "Low", and the rest all are either "Good" or "Adequate"!

Also note that the interpretation of these bars has changed from Sept '01. The bottom of each bar is the average measured MRTG flow to that site (previously daily minimum). Thus the bottom of each bar can be used to assess the relationship between the requirements and actual flows. Note that the requirements include a 50% contingency factor above what was specified by the projects, so a value of 66% would indicate that the project is flowing as much data as requested.

## Details on individual sites:

### 1) ASF ↔ CONUS:

Rating: ↓ Good → **Low**Web Page: [http://corn.eos.nasa.gov/performance/Net\\_Health/files/ASF-EMS.html](http://corn.eos.nasa.gov/performance/Net_Health/files/ASF-EMS.html)

Test Results:

| Source → Dest    | Medians of daily tests (kbps) |        |       | MRTG | TOTAL |
|------------------|-------------------------------|--------|-------|------|-------|
|                  | Best                          | Median | Worst |      |       |
| ASF → NESDIS     | 2297                          | 1385   | 643   | 72   | 1457  |
| ASF → GSFC-CSAFS | 1778                          | 1360   | 594   |      |       |
| GSFC-CSAFS → ASF | 1281                          | 997    | 159   |      |       |

Requirements:

| Source → Dest | FY       | mbps | Rating     |
|---------------|----------|------|------------|
| ASF → NESDIS  | '02, '03 | 1.61 | <b>Low</b> |

**Comments:** The 2.8 mbps total is very good for a 2 \* T1 (3.1 mbps) circuit. Since this is more than 30% over the Oct '02 requirement, the rating is "Good".

A problem with outflow from ASF began on 28 November, limiting thruput from ASF to a single T1. This was corrected on 5 December. However, performance dropped again (to about 800 kbps typical, with a high error rate) from Dec 17-21. Then, from 21 Dec to 2 Jan the performance was back to a single T1. The problem was fixed and normal operation resumed on 2 January '03.

But due to these problems, the rating for December drops to "Low"

### 2) GSFC → EDC:

Rating: Continued **Good**Web Page: [http://corn.eos.nasa.gov/performance/Net\\_Health/files/EDC.html](http://corn.eos.nasa.gov/performance/Net_Health/files/EDC.html)

Test Results:

| Source → Dest     | Medians of daily tests (mbps) |        |       | MRTG  | TOTAL |
|-------------------|-------------------------------|--------|-------|-------|-------|
|                   | Best                          | Median | Worst |       |       |
| DOORS → EDC Test  | 173.9                         | 103.1  | 64.0  | 105.6 | 208.7 |
| DOORS → EDC DAAC  | 186.2                         | 105.6  | 60.0  |       |       |
| G-DAAC → EDC DAAC | 113.4                         | 53.6   | 29.3  |       |       |

Requirements:

| Date    | mbps  | Rating      |
|---------|-------|-------------|
| Oct '02 | 147.2 | <b>Good</b> |
| Dec '03 | 228.0 | <b>Low</b>  |

The three test cases above continue to show the effects of the DAAC firewalls: the test shown on the top row has no firewalls in the path, just vBNS+. The next test goes through the EDC firewall, and the last test goes through both the GSFC and EDC firewalls. From these numbers, it does not appear that the EDC firewall has much of an effect on thruput, but the GSFC firewall does

This month the user flows were quite a bit higher than last month (by about 20 mbps on average), but the corresponding thruput tests were a bit lower, with the total about the same. The combined MRTG + thruput remains 30% above the Oct '02 requirement, so the rating is still "Good". But performance is still below the Dec '03 requirement.

**3) JPL:**Rating: Continued **Good**

Web Pages:

[http://corn.eos.nasa.gov/performance/Net\\_Health/files/JPL-SEAPAC.html](http://corn.eos.nasa.gov/performance/Net_Health/files/JPL-SEAPAC.html)  
[http://corn.eos.nasa.gov/performance/Net\\_Health/files/JPL-PODAAC.html](http://corn.eos.nasa.gov/performance/Net_Health/files/JPL-PODAAC.html)  
[http://corn.eos.nasa.gov/performance/Net\\_Health/files/JPL-TES.html](http://corn.eos.nasa.gov/performance/Net_Health/files/JPL-TES.html)

Test Results:

| Source → Dest           | Medians of daily tests (mbps) |        |       | MRTG | TOTAL |
|-------------------------|-------------------------------|--------|-------|------|-------|
|                         | Best                          | Median | Worst |      |       |
| GSFC-CSAFS → JPL-SEAPAC | 6.1                           | 5.9    | 3.8   | 0.8  | 6.7   |
| LaRC DAAC → JPL-TES     | 6.0                           | 5.9    | 4.5   |      |       |
| GSFC DAAC → JPL-TES     | 20.8                          | 16.5   | 8.6   |      |       |
| GSFC-MTVS1 → JPL-PODAAC | 6.0                           | 5.7    | 4.8   |      |       |
| ASF → JPL-SEAPAC        | 2.6                           | 1.3    | 1.2   |      |       |

Requirements:

| Source → Dest       | Date     | mbps | Rating |
|---------------------|----------|------|--------|
| GSFC → JPL combined | Oct '02  | 2.82 | Good   |
| GSFC → JPL combined | July '03 | 6.89 | Low    |
| LaRC DAAC → JPL-TES | July '03 | 4.58 | Good   |

The GSFC-JPL requirement above was revised in August revised to include all flows on the GSFC-JPL circuit, including flows from LaRC and flows to NASDA and ASF. The rating is based on testing via EMSnet from CSAFS at GSFC to SEAPAC at JPL. Note that the MRTG value above also includes these flows. The actual MRTG data for GSFC → JPL is available again, and the actual value used this month. It is a bit higher than the last value used – 0.6 mbps in September.

Performance on this circuit has been very stable since the BOP switchover on 15 August '02. With the combined requirement of 2.8 mbps, the performance continues to rate as “Good”. Adding in the 4.6 mbps of Aura requirements from LaRC, the performance is slightly below the combined 6.9 mbps requirement next July.

Performance from LDAAC to JPL-TES has also been very stable since it improved from 2.9 to 6.0 mbps on Aug 15, due to BOP.

The route from GDAAC to JPL-TES and JPL-PODAAC is still NISN SIP (since May 8 '02). The issue is that production and user flows cannot be separated by destination address, due to JPL's network architecture. JPL assigns only a single address to each node. Other DAACs have distinct internal and external addresses, which allows the production data to be sent to them on EMSnet, and user data via NISN SIP. Since the combined production and user flow exceeds the EMSnet requirement (based on production flow only), EMSnet does not have the capacity to support both. Thus the production flows are currently routed over SIP, which has higher capacity.

EMSnet testing to JPL-PODAAC is performed from MTVS1. Performance has been very steady at 6 mbps since the BOP upgrade on 15 August '02.

ASF → JPL-SEAPAC throughput was steady at about 2.7 mbps, using the 2 T1s. Problem with the circuit from ASF began on 28 November, and changed character several times in December, often limiting throughput from ASF to a single T1. This appears to have been corrected on 2 January '03.

**4) GSFC → LaRC:**Rating: Continued **Good**Web Page: [http://corn.eos.nasa.gov/performance/Net\\_Health/files/LARC.html](http://corn.eos.nasa.gov/performance/Net_Health/files/LARC.html)

Test Results:

| Source → Dest | Medians of daily tests (mbps) |        |       | MRTG | TOTAL |
|---------------|-------------------------------|--------|-------|------|-------|
|               | Best                          | Median | Worst |      |       |
| GDAAC → LDAAC | 88.3                          | 68.0   | 34.0  | 15.8 | 82.4  |

Requirements:

| Date    | mbps | Rating      |
|---------|------|-------------|
| Oct '02 | 38.3 | <b>Good</b> |
| Dec '03 | 60.0 | <b>Good</b> |

Performance has been stable since the BOP switchover in August '02, still rated "Good" vs. both the Oct '02 and Dec '03 requirements.

**5) NSIDC:**Rating: Continued **Good**Web Page: [http://corn.eos.nasa.gov/performance/Net\\_Health/files/NSIDC-EMS.html](http://corn.eos.nasa.gov/performance/Net_Health/files/NSIDC-EMS.html)

GSFC → NSIDC Test Results:

| Source → Dest     | Medians of daily tests (mbps) |        |       | MRTG | TOTAL |
|-------------------|-------------------------------|--------|-------|------|-------|
|                   | Best                          | Median | Worst |      |       |
| GSFC-DAAC → NSIDC | 89.0                          | 77.5   | 42.1  | 7.2  | 84.7  |

Requirements:

| Date    | mbps | Rating      |
|---------|------|-------------|
| Oct '02 | 29.2 | <b>Good</b> |
| Dec '03 | 53.1 | <b>Good</b> |

In November, testing was moved to a host at NSIDC with full-duplex connection, and performance improved further (total was 58 mbps in October). The ratings remain "Good".

Other Testing:

| Source → Dest      | Medians of daily tests (mbps) |        |       | Requirement | Rating           |
|--------------------|-------------------------------|--------|-------|-------------|------------------|
|                    | Best                          | Median | Worst |             |                  |
| JPL → NSIDC-SIDADS | 5.56                          | 4.01   | 3.07  | 0.26        | <b>Excellent</b> |
| LDAAC - NSIDC      | 4.82                          | 4.66   | 4.38  |             |                  |

Performance has been very steady from both sources since the Aug '02 BOP switchover. Thruput from LDAAC jumped to about 6 mbps on 31 October, but dropped back to 5 mbps on 28 November.

**6A) US → NASDA:**Rating: Continued **Adequate**Web Page: [http://corn.eos.nasa.gov/performance/Net\\_Health/files/NASDA-EMSnet.html](http://corn.eos.nasa.gov/performance/Net_Health/files/NASDA-EMSnet.html)

Test Results:

| Source → Dest          | Medians of daily tests (kbps) |        |       | MRTG | TOTAL |
|------------------------|-------------------------------|--------|-------|------|-------|
|                        | Best                          | Median | Worst |      |       |
| GSFC-CSAFS → NASDA-EOC | 2156                          | 1813   | 560   | 491  | 2304  |
| ASF → NASDA-EOC        | 1831                          | 1298   | 664   |      |       |

Requirements:

| Source → Dest | FY      | kbps | Rating          |
|---------------|---------|------|-----------------|
| GSFC → NASDA  | Oct '02 | 1854 | <b>Adequate</b> |
| GSFC → NASDA  | Dec '03 | 1620 | <b>Good</b>     |

Performance steady -- about as expected for the 3 mbps ATM PVC (using multiple TCP streams to mitigate TCP window size limitation at NASDA). Results from ASF to NASDA -- were affected by ASF problems (above) -- fixed in Jan. '03. Previous results were about the same as from GSFC.

**6B) NASDA → US:**Rating: ↑ Adequate → **Good**Web Pages: [http://corn.eos.nasa.gov/performance/Net\\_Health/files/JPL-SEAPAC.html](http://corn.eos.nasa.gov/performance/Net_Health/files/JPL-SEAPAC.html)[http://corn.eos.nasa.gov/performance/Net\\_Health/files/GSFC-SAFS.html](http://corn.eos.nasa.gov/performance/Net_Health/files/GSFC-SAFS.html)

Test Results:

| Source → Dest          | Medians of daily tests (kbps) |        |       | MRTG | TOTAL |
|------------------------|-------------------------------|--------|-------|------|-------|
|                        | Best                          | Median | Worst |      |       |
| NASDA-EOC → JPL-SEAPAC | 2328                          | 2291   | 1239  | 78   | 2369  |
| NASDA-EOC → GSFC-CSAFS | 1396                          | 1281   | 621   |      |       |

Requirements:

| Source → Dest | FY       | kbps | Rating      |
|---------------|----------|------|-------------|
| NASDA → GSFC  | '02, '03 | 1374 | <b>Good</b> |

NASDA has not yet implemented testing with multiple tcp streams. So performance to GSFC is limited by the TCP window size on NASDA's test machine, in conjunction with the long RTT. Therefore, in order to reflect the actual capability of network, the rating will be derived from testing from NASDA to JPL. This test uses the same Trans-Pacific circuit, but has a shorter RTT, so will not be as severely limited by the TCP window size. The trans-Pacific circuit connects into the higher speed domestic EMSnet at JPL, which is not expected to be the limiting factor.

Performance continues stable on the new circuit. However, the change in rating methodology improves the rating to "Good"



**7) GSFC → ERSDAC:**Rating: Continued **Low**Web Page: [http://corn.eos.nasa.gov/performance/Net\\_Health/files/ERSDAC.html](http://corn.eos.nasa.gov/performance/Net_Health/files/ERSDAC.html)

## GSFC → ERSDAC Test Results:

| Test Period           | Medians of daily tests (kbps) |        |       | MRTG | TOTAL |
|-----------------------|-------------------------------|--------|-------|------|-------|
|                       | Best                          | Median | Worst |      |       |
| 12-Nov-02 – 31-Dec-02 | 6449                          | 135    | 26    | 83   | 218   |
| 4-Jun-02 – 11-Nov-02  | 795                           | 771    | 460   | 73   | 844   |

## Requirements:

| Source → Dest | FY       | kbps | Rating     |
|---------------|----------|------|------------|
| GSFC → ERSDAC | '02, '03 | 467  | <b>Low</b> |

Performance using the 1 mbps ATM connection (since June '02) had been very stable until November 12, when performance became noisy and erratic. The rating dropped to “Low” at that time. The problem was fixed on 3 Jan '03.